

WHAT IS CLAIMED IS:

1. A transmitting apparatus in a ring network in which a plurality of transmitting apparatuses are connected in ring form so as to be capable of transmitting in each of upstream and downstream directions, working and protection channels are assigned to each direction and, when failure occurs in a transmission path, a transmit signal is looped back using the protection channel to effect rescue, said apparatus comprising:
 - 10 rescue-impossible detection means for detecting that communication between an insert transmitting apparatus that incorporates a packet, which enters from a lower-order side, into a higher-order signal and transmits the signal to a transmission path, and a drop transmitting apparatus that extracts the packet from the higher-order signal and transmits the packet to another lower-order side, has become unrescuable owing to transmission-path failure; and
 - 20 packet-transmission halting means for halting transmission of the packet to the transmission path when communication has become unrescuable.
 2. The apparatus according to claim 1, further comprising failure-occurrence detection means for detecting that multiple failures have occurred at multiple locations in a transmission path and obtaining a signal non-arrival range within which a signal does not arrive owing to the multiple failures at the multiple locations;

said rescue-impossible detection means of the
 insert transmitting apparatus determining that rescue is
 impossible when the drop transmitting apparatus resides
 in the signal non-arrival range.

- 5 3. The apparatus according to claim 1, further
 comprising failure reporting means, wherein when an
 upstream connection and a downstream connection are set
 as a pair and the upstream connection becomes
 unrescuable, said failure reporting means sends a
10 failure notification packet to a packet transmitting
 source on the lower-order side via the downstream
 connection of the pair.
4. The apparatus according to claim 2, wherein a first
 transmitting apparatus that has detected failure in a
15 transmission path in one direction of upstream and
 downstream directions transmits, in the one direction, a
 first packet (long packet), which reports occurrence of
 the failure, to a second transmitting apparatus between
 which and the first transmitting apparatus a failure
20 point is sandwiched, and transmits, in the other
 direction, a second packet (short packet), which reports
 occurrence of the failure, to the second transmitting
 apparatus; the second transmitting apparatus, which has
 received the first packet, transmits, in said other
25 direction, a third packet (long packet), which reports
 occurrence of the failure, to the first transmitting
 apparatus; and said failure-occurrence detection means
 of the insert transmitting apparatus detects occurrence

of multiple failures based upon destination of each long packet that has been transmitted from another transmitting apparatus.

5. The apparatus according to claim 2, further
5 comprising a table for retaining apparatus IDs of packet-drop transmitting apparatus in association with packet connection IDs;

10 said rescue-impossible detection means of the insert transmitting apparatus obtaining, from said table in response to occurrence of multiple failures, a drop transmitting apparatus of a packet that enters from the lower-order side, and deciding that rescue has become impossible when said drop transmitting apparatus resides in the signal non-arrival range.

- 15 6. The apparatus according to claim 1, wherein when communication has become unrescuable owing to transmission-path failure in a point-to-multipoint drop connection that transmits the same packet from one insert transmitting apparatus to a plurality of drop 20 transmitting apparatuses, a packet-transmission halting means of said insert transmitting apparatus halts transmission of the packet to the transmission path.

- 25 7. The apparatus according to claim 5, wherein the apparatus ID of a drop transmitting apparatus farthest from the insert transmitting apparatus in the direction of packet transmission is retained in said table in a point-to-multipoint drop connection that transmits the same packet from one insert transmitting apparatus to a

plurality of drop transmitting apparatuses; and
said rescue-impossible detection means of the
insert transmitting apparatus obtains, from said table
in response to occurrence of multiple failures, a
5 farthest-end drop transmitting apparatus of a packet,
and decides that rescue has become impossible when said
drop transmitting apparatus resides in the signal non-
arrival range.

8. The apparatus according to claim 6, wherein in a
10 case where the same connection ID is not used in
different spans of a network in a point-to-multipoint
drop connection that transmits the same packet from one
insert transmitting apparatus to a plurality of drop
transmitting apparatuses, said rescue-impossible
15 detection means of the insert transmitting apparatus
decides that rescue has become impossible when a drop
transmitting apparatus nearest to said insert
transmitting apparatus resides in the signal non-arrival
range.

20 9. The apparatus according to claim 5, wherein in a
case where the same connection ID is not used in
different spans of a network in a point-to-multipoint
drop connection that transmits the same packet from one
insert transmitting apparatus to a plurality of drop
25 transmitting apparatuses, the apparatus ID of a drop
transmitting apparatus nearest to the insert
transmitting apparatus in the direction of packet
transmission is retained in said table; and

said rescue-impossible detection means of the
insert transmitting apparatus obtains, from said table
in response to occurrence of multiple failures, a
nearest-end drop transmitting apparatus of a packet, and
5 decides that rescue has become impossible when said drop
transmitting apparatus resides in the signal non-arrival
range.

10. The apparatus according to claim 1, wherein when
communication has become impossible owing to multiple
10 transmission-path failures in a multipoint-to-point
insert connection that transmits packets from a
plurality of insert transmitting apparatuses to one drop
transmitting apparatus using the same connection ID, a
packet-transmission halting means of each insert
15 transmitting apparatus halts transmission of the packet
to the transmission path.

11. The apparatus according to claim 1, wherein in a
case where the same connection ID is not used in
different spans of a network in a multipoint-to-point
20 insert connection that transmits packets from a
plurality of insert transmitting apparatuses to one drop
transmitting apparatus using the same connection ID,
said rescue-impossible detection means of each insert
transmitting apparatus decides that rescue has become
25 impossible when the drop transmitting apparatus resides
in the signal non-arrival range.

12. The apparatus according to claim 5, wherein in a
case where the same connection ID is not used in

different spans of a network in a multipoint-to-point insert connection that transmits packets from a plurality of insert transmitting apparatuses to one drop transmitting apparatus using the same connection ID, the

5 ID of the drop transmitting apparatus is retained in said table of each insert transmitting apparatus; and when failures occur at multiple locations, said rescue-impossible detection of each insert transmitting apparatus obtains a multipoint-to-point drop

10 transmitting apparatus and decides that rescue has become impossible when this drop transmitting apparatus resides in the signal non-arrival range.

13. The apparatus according to claim 6, further comprising failure reporting means, wherein a

15 multipoint-to-point insert connection and a point-to-multipoint drop connection are managed as a pair and, when a prescribed insert connection becomes unrescuable, said failure reporting means inserts a failure notification packet in the drop connection of the pair.